NOTES ON A COLLECTION OF POLYPLACOPHORA FROM CARNARVON, WESTERN AUSTRALIA, WITH DEFINITIONS OF A NEW GENUS AND TWO NEW SPECIES.

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Plates XVI. to XIX.

I am indebted to Mr. Worsley C. Johnston, of Western Australia, for the gift of one of the most remarkable collections, though small as to number of species, of Polyplacophora ever made on the occasion of a single brief visit.

It includes, amongst others, a small but new shell of a unique type that requires the establishment of a new genus for its reception; the rediscovery of a particularly interesting form of *Sclerochiton*, that has only been known from a single specimen, in the British Museum, and concerning which doubt has been expressed as to whether it was of Australian origin; and, finally, the rediscovery of a strange form of *Cryptoplax* that has been only known from a single minute specimen deposited in the Berlin Museum.

The collection was made on the occasion of a brief visit to Carnarvon, situated in Shark Bay, Western Australia. The entire absence of one of the commonest shells of that State, *Liolophura hirtosus*, (Peron) Blainville, of which I have specimens from as far north as the Abrolhos Islands, is characteristic of the whole collection. All except two species are apparently tropical forms. The absence of any representative of the genus *Plaxiphora* is the more remarkable, because at Dongarra, 300 miles further to the south, I found them living together with *Onithochiton scholvieni*, this latter being very numerous at Carnarvon.

Tonicia (Lucilina) delecta, Thiele, 1914.

Pl. xviii., fig. 2.

(Thiele, Fauna Sudwest Australiens, *Polyplacophora*, pp. 297, 298, 1911; Ashby, Trans. Roy. Soc. of S. Austr., vol. xlv., p. 47, pl. vii., fig. 2 a, b, c.)

Four specimens of this interesting shell were taken, and they are, I believe, the first that have been found other than on pearl shell.

As the complete shell has not hitherto been figured, I include a photograph.

Onithochiton scholvieni, Thiele, 1910.

Pl. xviii., fig. 1.

(Thiele, Rev. des Sys. der Chitonen, Zool., pt. 2, p. 99, pl. x, figs. 60, 61, 1910; Ashby, *l.c.*, p. 45.)

A very fine series of this beautiful *Onithochiton* were collected. Owing to their perfect condition they reveal features in colour and sculpture that have not before been noticed. As no figure of the complete shell has been published, I include a photograph.

Acanthopleura gemmata, Blainville, 1825.

(*Chiton gemmatus*, Blain., Dict. Sc. Nat., xxxvi., p. 544, 1825; Ashby, Journ. and Proc. Roy. Soc. W. Austr., vol. viii., p. 29, 1921.)

Half a dozen juvenile, well-preserved specimens were secured of this species. They are interesting in that the girdle in some of them is furnished with unusually long spicules.

CRYPTOPLAX MICHAELSENI, Thiele, 1911.

Mr. Johnston is to be heartily congratulated on the rediscovery of this interesting little *Cryptoplax*. Until now no Australian worker has had an opportunity of examining this species, our knowledge of it having been limited to the single, minute example in the Berlin Museum. So outwardly is it like members of the genus *Acanthochiton* that Dr. Thiele had disarticulated it before he discovered that it belonged to quite a different group. A full description will be given in another paper.

Acanthochiton bednalli, Pilsbry, var. **johnstoni,** n. var.

(Pilsbry, Proc. Acad. Nat. Sci. Phil., 1894, p. 81, pl. ii., figs. 7-11.)

Three specimens, of which the largest measures 12×6½ mm., of a very pretty *Acanthochiton* were collected at Carnarvon. In general appearance it differs from *A. bednalli,* as we know it in South Australia and Tasmania. The differences I have been able to detect do not seem to warrant the giving to it full specific rank, so I content myself, for the present, in distinguishing it under a varietal name only, and have pleasure in naming it after the finder, Mr. Johnston. I sent the three specimens to my friend, Mr. W. L. May, of Tasmania, and he fully concurs with me in thinking that, at least, the shell deserves this distinction.

DESCRIPTION.

The ground colour is white, almost porcelain-white, with a regular zigzag pattern and mottling of greenish-black. The girdle is dark, densely clothed with white spicules, the hair tufts are white, and the girdle fringe is white.

The dorsal area on valve 2, of two of the specimens, is bright pink, and on the other rufous. The sculpture seems normal except that the dorsal area is decidedly narrower than in typical *A. bednalli,* and has none of the deep, longitudinal grooving so characteristic of that species. A large portion of that area is quite smooth and polished, but possesses subcutaneous, longitudinal lining, in this respect corresponding with *A. granostriatus.* There can be detected on several of the dorsal areas, especially at the sides next the pleural area, some broken, longitudinal scratching. It is just possible, though perhaps improbable, that this feature, together with the longitudinal, subcutaneous lining, are survivals of the deep, longitudinal grooving of typical *A. bednalli.*

Dr. Thiele recorded *A. bednalli* as having been collected at Shark Bay by Drs. Michaelsen and Hartmeyer. I conclude, therefore, that it was the present form that they took; nevertheless I cannot but think, after all, this may prove a distinct species. The thoroughly tropical character of the fauna leads one to suspect that the characters of this shell rather simulate those of *A. bednalli,* than that there is any near relation.

SCLEROCHITON MILES, (Carpenter) Pilsbry, 1892.

Pl. xviii., figs. 3, a, b, c, d.

(*Chiton miles,* Carp. MS.; *Sclerochiton miles,* (Carp.) Pilsbry, Man. Con., xiv., p. 189, pl. 46, figs. 1-5, 1892; *Sclerochiton curtisianus,* Smith of Ashby, Jour. and Proc. Roy. Soc. W. Austr., vol. vii., 1921-2, p. 34; non *Chiton miles,* Pils. of Hedley, Marine Fauna Q'land, 1909; non *Sclerochiton miles,* (Carp.) of Thiele, Rev. des Sys. der Chitonen, pt. ii., p. 94.)

Amongst the chitons from Carnarvon are several with large, imbricating, girdle scales, simulating in general appearance *Sypharochiton pellis-serpentis,* which in sculpture and in the possession of eyes still more closely simulating pale forms of *Liolophura hirtosus.* In addition, the absolute absence of radial ribbing further separates it from these. On comparison with specimens in my

collection of Sclerochitons such as *S. curtisianus* and *S. imitator,* its distinction was at once apparent, in that it has large imbricating scales.

Pilsbry's description *(l.c.),* which, with his figures was prepared from drawings and MS. of Carpenter, as far as it goes, agrees with the specimens under review, with the exception that Carpenter's drawing, as reproduced, shows the scales on the girdle as widely separated, but the letterpress says "more or less separated." I then turned up my note on the examination of the type in the British Museum. It reads, "Has large, imbricating scales quite different from *Sclerochiton curtisianus,* Smith." Mr. Iredale informed me that the type was unique, and although labelled "Torres Strait" cannot be considered an Australian shell. My foregoing note quite clears up the discrepancy in the girdle as figured by Pilsbry. Possibly Carpenter's drawing was made from portions of the girdle from which many scales had broken away.

Pilsbry gives the number of slits in the insertion plate of the posterior valve as, obscurely, 9-11. In a juvenile specimen, examined by me, there is only one slit on each side. In an old eroded specimen I have disarticulated the slits are probably the same, but owing to the breaking down of the thin laminae, which in this species take the place of teeth in the insertion plate, this feature is somewhat obscure. I do not think this species is multifissate; Pilsbry's determination of this point, quite probably, was from another species.

Dr. J. Thiele figures under the name of *S. miles* portions of three specimens of Sclerochiton that were brought from Sumatra, which he considered either conspecific or closely allied to *miles.* His figures and description very well illustrate a partly-worn specimen of this species, with the exception of the character of the girdle, which, he states, is furnished with two forms of spicules in addition to the possession of scales. I cannot find the slightest trace of any such feature on any of the shells from Carnarvon, so that it is quite evident the two forms are not conspecific.

The specimen in the Western Australian Museum, No. 9336, referred to in my paper *(l.c.),* in which the whole of the sculpture had been eroded, is certainly *S. miles,* and not *S. curtisianus,* Smith, as therein suggested.

Unfortunately in disarticulating that specimen from Point Cloates, the whole of the scales were, through a mishap, lost, so their true character was overlooked.

In conclusion.—S. miles does not conform to the genus *Sclerochiton,* as defined by Thiele, in that it has no spicules between the scales, neither does it agree with Dr. Dall's definition of that genus in that instead of having "separated scales" they are imbricating.

It seems to combine, in itself, characters that have been gathered (shall I say?) from four different genera—*Acanthopleura, Liolophura, Sclerochiton,* and *Sypharochiton*—and must, therefore, be considered an intermediate form, indicating the close relationship of all these four genera.

The radula was not present in the specimens disarticulated, so I am unable to refer to its characters.

Habitat.—The type is in the Cuming collection in the British Museum, No. 42, but the locality stated on its tab. must be considered incorrect. The specimens in the Museum in Perth, from Point Cloates, were, I believe, collected by Mr. Tom Carter; those under review are from Carnarvon, a little further to the south. I have specimens in my collection of *S. curtisianus,* from Moreton Bay, in Queensland, and from Port Darwin, in the Northern Territory; but whether this latter is the extreme limit westward of that species must be left for future investigation. As far as our present knowledge is concerned, there are fully fifteen hundred miles of coastline separating the two species.

Sclerochiton thielei, n. sp.

(=*Sclerochiton miles* (Carpenter) of Thiele, Revis. des Syst. der Chitonen, Zool., 1910, pp. 94, 95, pl. x., figs. 16-23.)

The three specimens described and figured by Dr. Thiele *(l.c.)* were collected at Pulotikus, Benkulen, in Sumatra, by Ed. V. Martens. Dr. Thiele remarks, "This species is certainly closely related to *Sclerochiton miles,* from Torres Straits, but whether it is really identical with that species or not, cannot be concluded with any certainty from the description."

The rediscovery of Carpenter's (MS.) shell *S. miles,* makes it quite clear that although very similar in sculpture and form the characters of the girdle show it to be quite distinct.

Thiele says in reference to the Sumatra shells:—"The scales upon the upperside of the girdle are of different sizes, sometimes even 0·5 mm. broad, with converging ribs on their free ends. Between them and over the edge, there are small calcareous needles, about 80 μ long and 12 μ thick, while the fringe needles are about 150 μ long and 33 μ thick." There are no spicules between the girdle scales of *Sclerochiton miles* and no fringe spicules, showing that the two are not conspecific; the Sumatra shell conforms to Dr. Thiele's definition of the genus *Sclerochiton,* whereas *S. miles,* owing to its lack of girdle spicules, does not.

I have therefore much pleasure in naming the species described *(l.c.)* after Dr. Thiele, in recognition of the splendid work he has rendered in his production of his "Revision des Systems der Chitonen."

Family Ischnochitonidae, Pilsbry.

Sub-Family Ischnochitoninae, Pilsbry.

Genus **Lophochiton**, n. gen.

Having strong radiating ribs or flutes on both end valves; lateral areas, two radial ribs; median areas, coarsely sculptured with longitudinal ribs composed of closely-packed granules. Numerous slits in both end valves and 1-1 in median, teeth sharp, slits broad and shallow, but in no case "festooned" upwards at slits, as is the case in the genus *Callistochiton;* slits in end valves mostly opposite to the ribs, except the outer ones. A striking feature in the type species, possibly of secondary importance, is the existence on the pleural areas and on the posterior margin of all, except the tail valve, of long, finger-shaped, often coalesced granules; girdle clothed with thin, flattened, rather large, imbricating, ribbed scales.

Note.—The sculpture of the genus *Callistochiton* is simulated in the sculpture of the end valves, and lateral areas to a less degree, and also in the placing of the slits mostly opposite the ribs in the end valves. On the other hand, it corresponds with the *Ischnochitoninae,* in having sharp teeth in the insertion plate, and the entire absence of "festooning" at the slits. I think it not unlikely that Torr's highly-sculptured *Ischnochiton bednalli* may belong to this genus, and possibly *Ischnochiton pilsbryi,* Bed., as well, but I have not examined disarticulated specimens of these. Dr. Thiele points out that the correspondence of the slitting with the ribs is not constant in members of the genus *Callistochiton,* citing *C. adenensis,* Smith, as an example. I have examined specimens of that species in my collection which were given to me by Major Dupuis, and find that this is correct, as regards the end valves, the festooning in them being also suppressed; the slits in the median valves of that species are "festooned," as in typical Callistochitons.

I suggest that these features have been suppressed in the end valves of *C. adenensis,* owing to the great multiplication of the ribs, because I have noticed that where ribs bifurcate, no additional slits are formed. In *C. adenensis* the ribs have been so increased with corresponding reduction in size, that all trace of the position of the original ribs has been lost, and the upward festooning has likewise been suppressed. With the change in the sculpture in the tegmentum no room is left for the "festooning" under the eaves.

I designate *Lophochiton johnstoni,* Ashby, as the type of this new genus, the name being suggested by the fluted character of the sculpture of the end valves.

Lophochiton johnstoni, n. sp.

Pl. xvi., figs. 7 a, b, c; pl. xvii., figs. 1, 1 a, b, c, d.
Pl. xix., fig. 5.

Introduction.—Among the specimens collected at Carnarvon, by Mr. Worsley C. Johnston, is a small chiton bearing features I have observed in no other species. At first I referred it to *Callistochiton recens,* Thiele, which was collected in Useless Inlet, Shark Bay, in 1905, by Drs. Michaelsen and Hartmeyer, and described, but not figured, by Dr. J. Thiele on the Fauna of South-west Australia of 1911, p. 402.

But as the specimen from Carnarvon lacks some of the more important characters that distinguish the genus *Callistochiton,* especially the "festooning" of the slits in the insertion plates, and also possesses several most striking features that are not mentioned by Thiele, I have given it the name of *Lophochiton johnstoni,* after the gentleman to whose earnest efforts we are indebted for its discovery.

General appearance.—Broad, carinated, side slope a little curved, and valves radially ribbed, as in *Callistochiton;* lateral areas having two ribs, median areas decorated with ribs composed of longitudinal rows of granules. Girdle broad, banded, clothed with large, flat, thin, fluted, imbricating scales.

Colour.—Light Buff (pl. xv., Ridgway's Colour Standards) suffused with a pinkish tinge near the girdle, one large and two small orange spots are present on each side of the posterior margin of the anterior valve, and a similar, though darker, spot at the extreme end of the tail valve. The girdle is also light buff with darker bands.

Anterior valve.—Having fourteen rays or flutes, which give to the margin a crenate appearance, these rays are hardly perceptible on the first third of valve, so that in an extremely juvenile specimen they might be overlooked. The whole valve is covered with small, white granules; on the first third they seem to be round, but towards the girdle they increase in size and have a tendency to elongate; the posterior margin of the tegmentum is very deeply toothed, these teeth being composed of two or three elongate granules which have coalesced—this feature is most marked and probably unique. The ground colour between the granules in all valves is pinkish-buff; the outer orange spot, before referred to, is several times as large as either of the other two. Inside is white, teeth sharp, unserrated, there are 11 slits, which are broad, straight-sided, not "festooned" upwards, as in *Callistochiton,* teeth remarkably even and placed opposite the ribs, the outer ribs and one branch of a bifurcated rib have no slits opposite.

Posterior valve.—Postmedian, shallow, sloping behind mucro very gradually to the girdle. The anterior portion of this valve is decorated with white granules, those immediately in front of the mucro are round, but as the anterior edge of valve is approached they increase rapidly in length, becoming finger-like

and more or less coalesced and irregular. On the sides, corresponding with the pleural area of the median valves, these much-elongated granules are formed into longitudinal rows. The posterior half of this valve is much raised and decorated with twelve rays or flutes, of which the two anterior ones are much the strongest. The whole of this area is covered with round, white granules. *Inside.*—Transparent white, sinus broad, sutural laminae straight and parallel with tegmentum, slits 10, mostly opposite the ribs, the outer two having no corresponding slits.

Median valve.—The dorsal area is broadly wedge-shape and covered with white granules, which are small towards the apex but rapidly increase in size anteriorly and laterally, those adjoining the pleural area are long and finger-shaped; there does not seem to be any system in the arrangement of the grains in the dorsal area. The pleural area is very distinct, being decorated with bowed longitudinal rows of white granules; the five next the dorsal area composed of small, round, detached granules, whereas the outer five rows have extremely elongated, white, finger-like granules, which are more or less coalesced into high granulose ribs, which are increasingly raised as they approach the girdle. The ribs are widely spaced, but there is no indication of any bridging or net-work, so characteristic of Callistochitons. The lateral area is proportionately very narrow, composed of two very strongly-raised ribs, the anterior more raised than the posterior, with a deep sulcus between them, the whole of this area is covered with small, rounded, white granules, but towards the outer margin there are several masses of elongate, coalesced, widely-spaced, white granules, the posterior margin of these valves is irregularly toothed with very similar elongate processes with rounded ends, becoming coarser towards the girdle; the anterior margin is also toothed, many of them being double-headed. Inside transparent white, the tegmentum is folded over and in valve 2, pleated under the beak, sinus broad and edge bowed forward, sutural laminae shallow, waved inwards, edge in some is parallel with tegmentum, in others slightly rounded, slits 1-1, broad, sharp cut, straight-sided, eaves well defined, insertion extending beyond the tegmentum.

Girdle.—The girdle is very broad in proportion to the size of the shell, being 1·25 mm. in width, is clothed with flat, thin, fluted, imbricating scales, the scales are subpointed and have 6-7 grooves, the ribs between the grooves being shallow and flat. The scales are thinner than and quite distinct from those of any *Callistochiton* I have seen.

Measurement.—The dry specimen measures over all $7 \times 4\frac{1}{2}$ mm.; as the girdle is only in one part uncurled, and there measures 1·25 mm., the living animal would probably be $\frac{3}{4}$ mm. broader.

Habitat.—Carnarvon, in the extreme north of Shark Bay, Western Australia, collected by Mr. Worsley C. Johnston, to whom I am greatly indebted for the specimen.

In conclusion.—As before stated, I have had great difficulty in deciding whether this species is distinct from Thiele's *Callistochiton recens,* for, although the most unusual and striking characters present in the shell under review are not mentioned at all by Thiele, there is always the possibility of such features being undeveloped in a very juvenile specimen. But after making every allowance for the difference in the size of the two specimens, it seems impossible that these characters could have been overlooked by Thiele. I append a short *resume* of the correspondence and differences between the two descriptions. As before stated, the fact that Thiele did not figure *C. recens* has added greatly to the difficulty.

COMPARISON.

C. recens, measures 5×3 mm.	*C. johnstoni,* 7×4¼ mm.
Whitish, with pale grey and brown flecks.	Light buff, pinkish tinge, orange spots.
Side slope straight.	Side slope slightly curved.
Girdle somewhat banded.	Girdle banded.
Lateral areas closely granulated, more so still on posterior edge.	Lateral areas with two much raised, very distinct, radial ribs.
In pleural area granules clearly arranged in longitudinal rows, not closely packed in the rows.	In pleural area granules arranged in longitudinal rows, very closely packed, and becoming long and finger-like.

In both, the slits in the anterior valve correspond with the ribs, the mucro is shallow, and the posterior slope gradual in both. In *C. recens,* nothing is said about the scales, beyond that they are large and have 8-9 strong ribs, whereas the larger shell, *C. johnstoni,* has 6-7 ribs.

Pilsbry, in Man. Con., vol. xv., p. 260, places great emphasis on "the peculiar insertion teeth, which are curved upwards into the ribs as if festooned," as being one of the most important characteristics of his genus *Callistochiton.* Dr. Thiele makes no reference to this feature in his *C. recens,* but we must presume that he would hardly have placed it in that genus had such not been the case, neither does he make any mention of radial ribs in the posterior valve, nor the twin ribs of the lateral area. Further, he makes no mention of the protuberances I have called teeth, on the posterior margins of the valves, and no mention is made of the unique, finger-like, knobby granules of the pleural area and tail valve, all of which are marked features in *C. johnstoni.*

It is unfortunate that the differences have to be so largely determined upon negative data, but there is one piece of positive data available. Thiele states *(l.c.),* "We see the shell is like that described and drawn in *Callistochiton finschi* (Zool. Heft., 56, p. 86, tab. 8, figs. 57-60)." A reference to these figures shows practically no correspondence between it and the shell from Carnarvon.

For description of Plates see pp. 242 and 243.